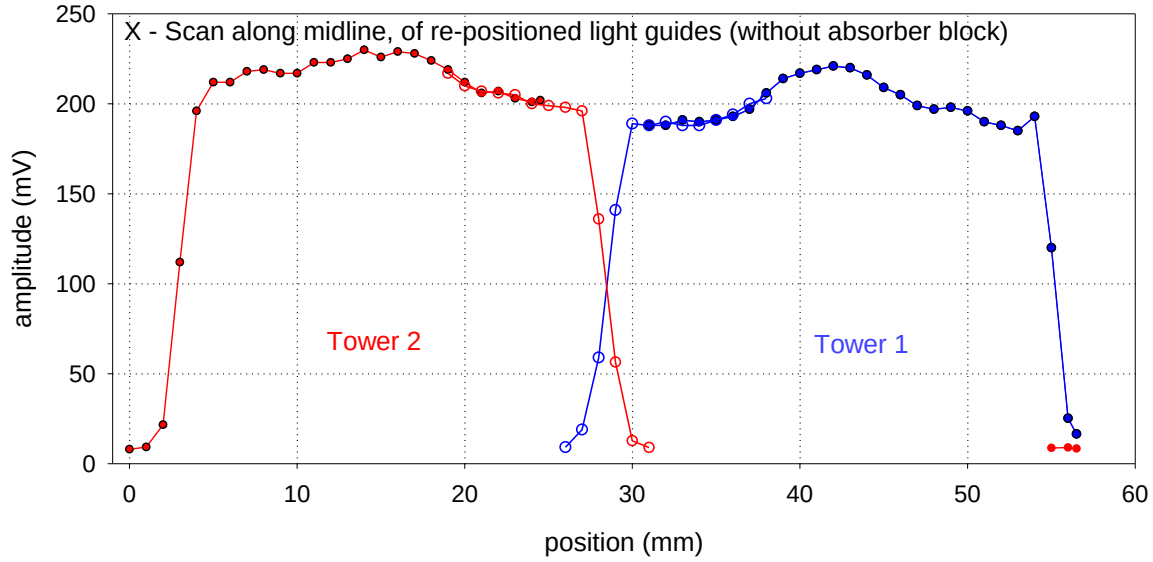
Light Guide Status and Uniformity

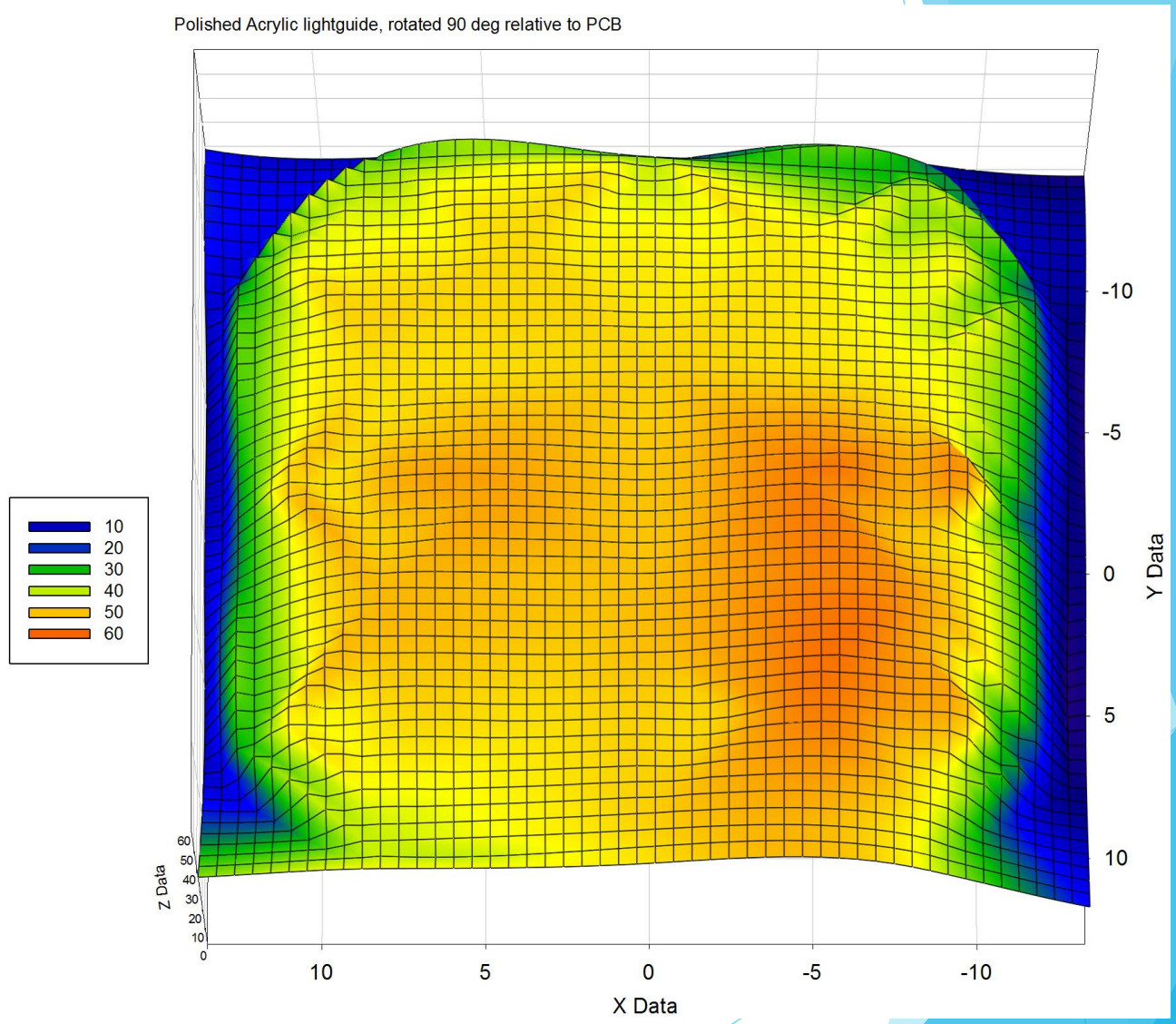
EMCal biWeekly Mtg Aug 30, 2016

Prototype Issues:
Asymmetry / non-uniformity

- Observed asymmetry in the light collection/response appears to be due to a lateral offset of the light guide relative to the sipms. When the light guides are better centered on the sipms, the response becomes more symmetric, but there is still some remaining non-uniformity. Possibly due to positioning of sipms (6mm x 7mm) or lightguide dimensions (26.3mm x 23.3 mm)?

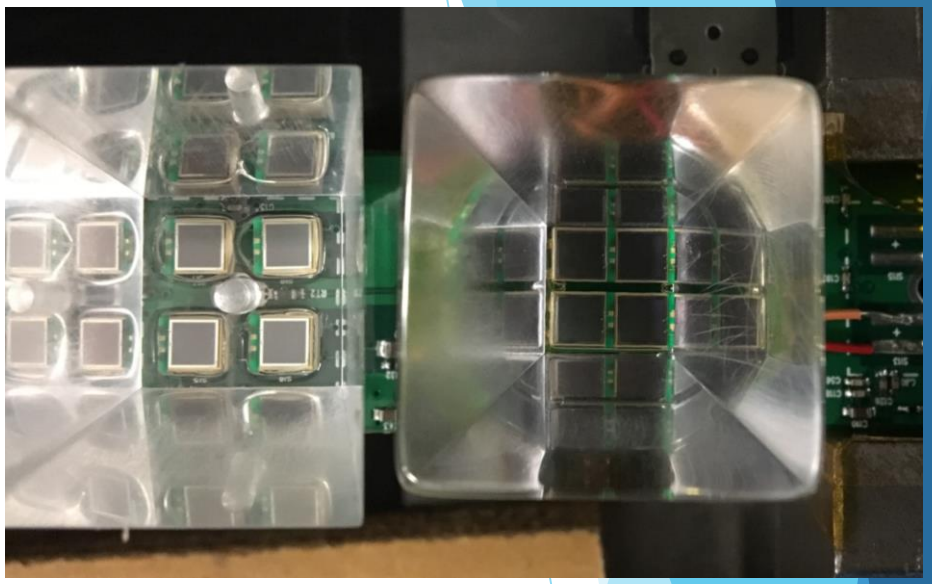


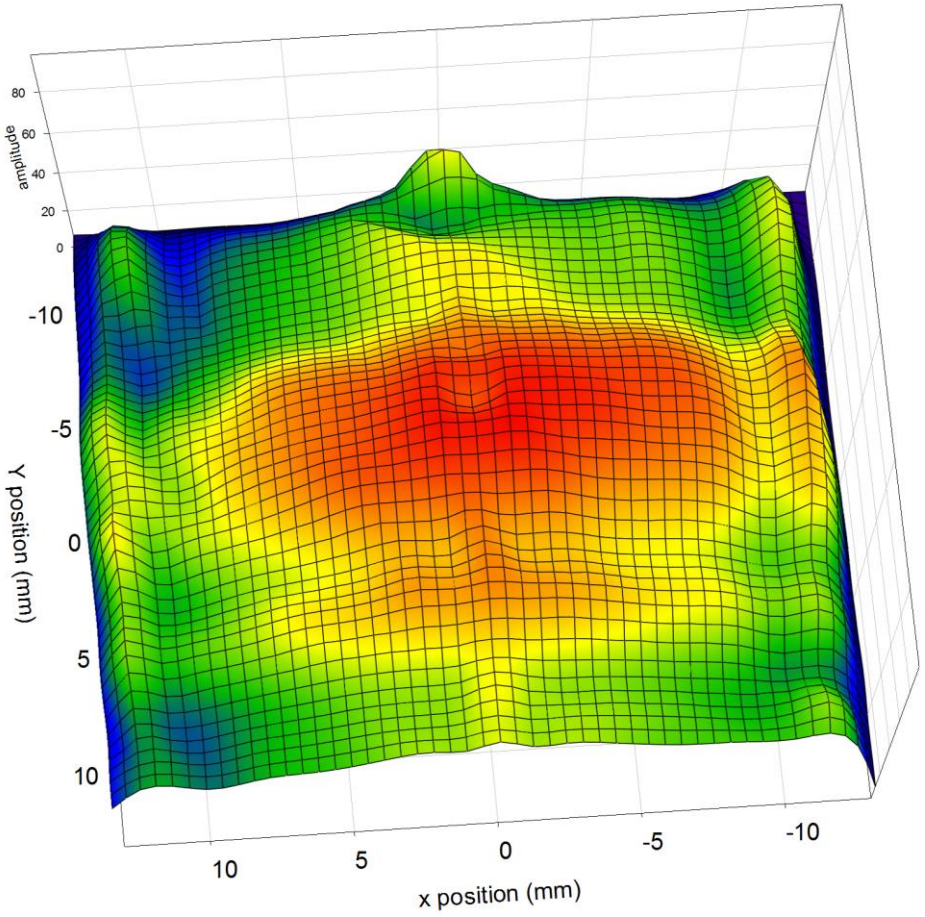
Acrylic LG rotated 90 deg to better fit footprint of sipms



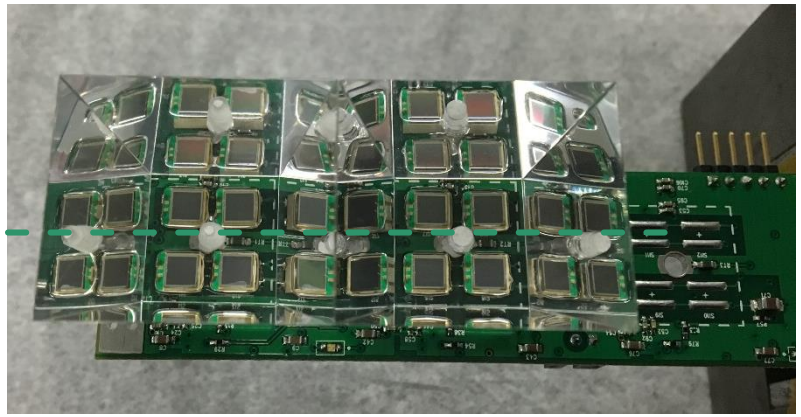
Earlier machined acrylic LG design, with closer sipm spacing – shows “gutter effect?” peaks as seen in Mike Phipps’ simulation

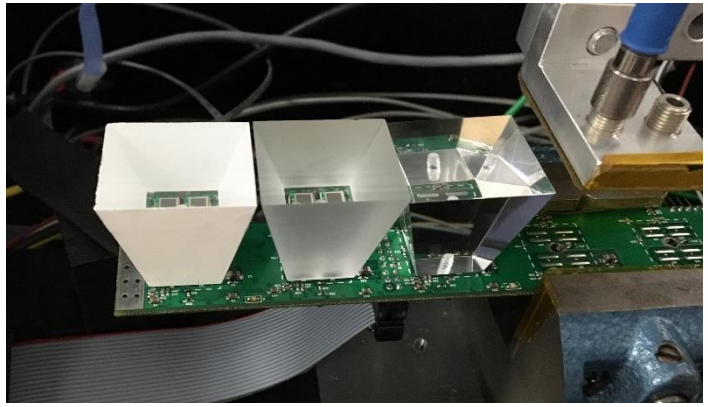
- Need to compare overall efficiencies
- Would need to come up with another way to mount it (no screw hole)

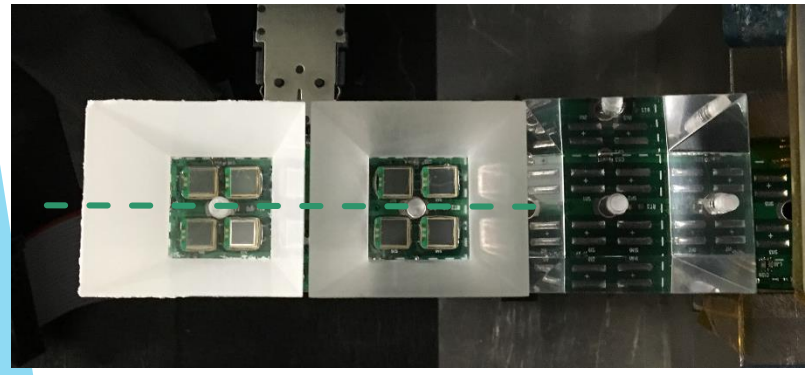


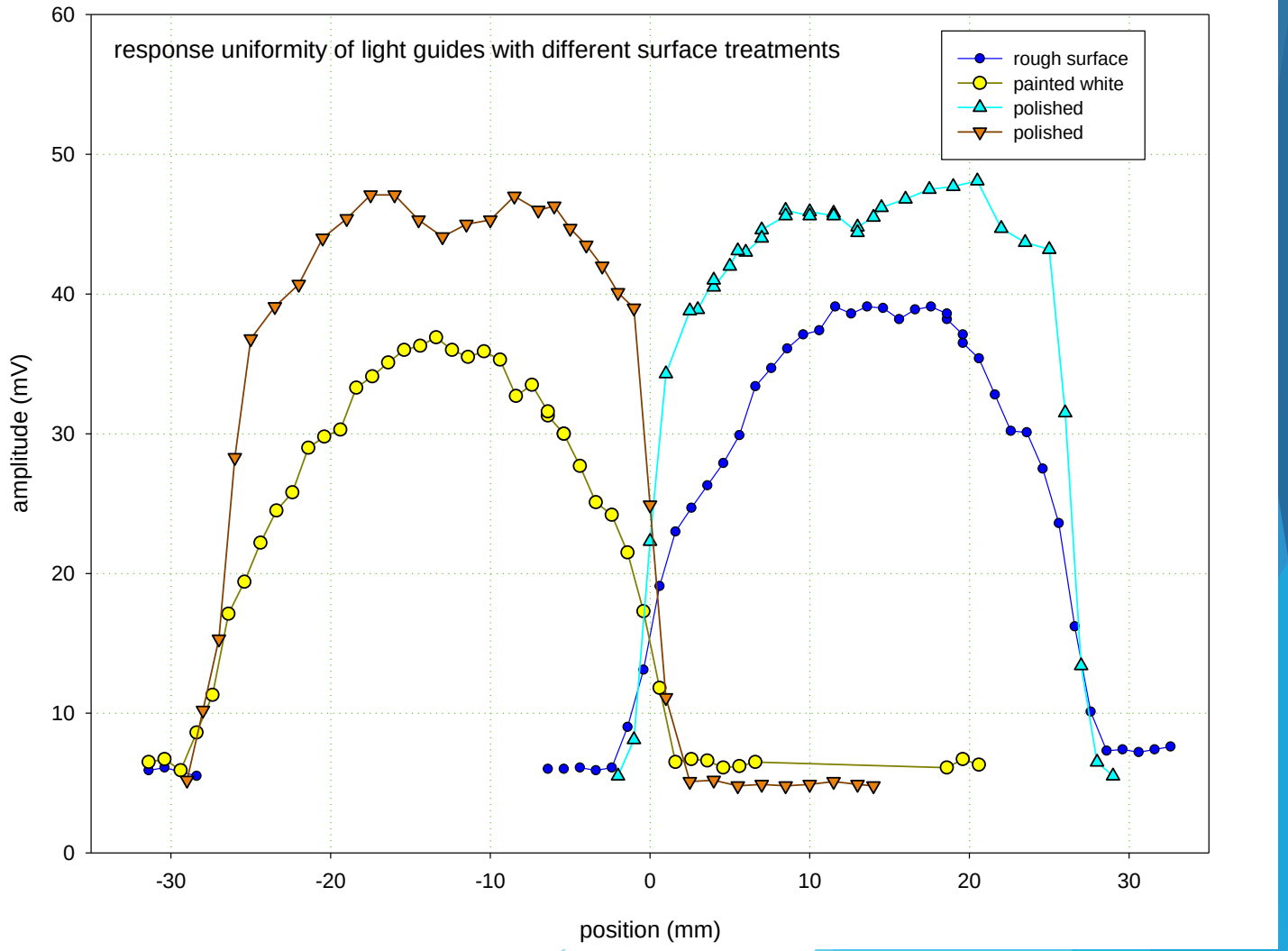


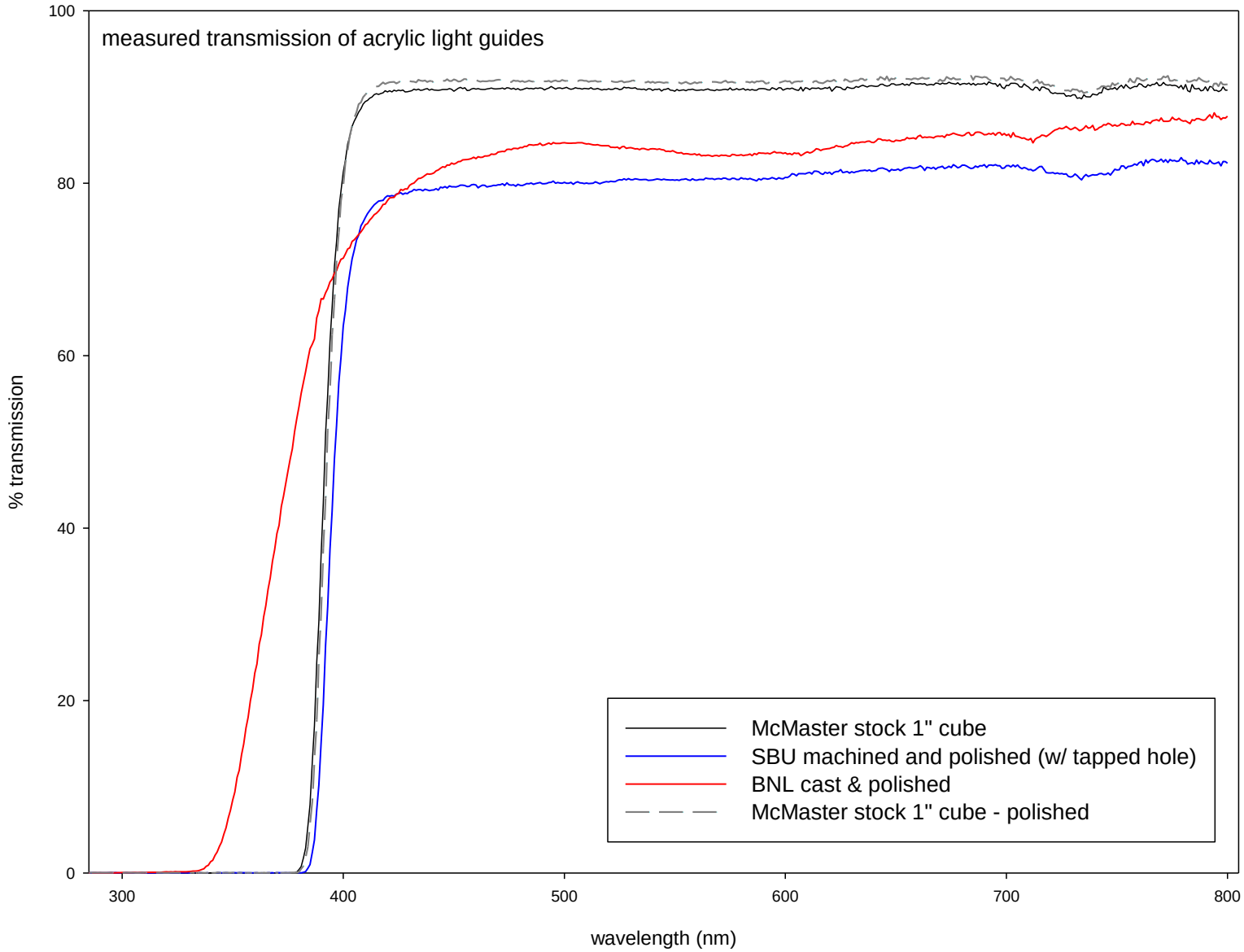
Effect of Surface treatments on response







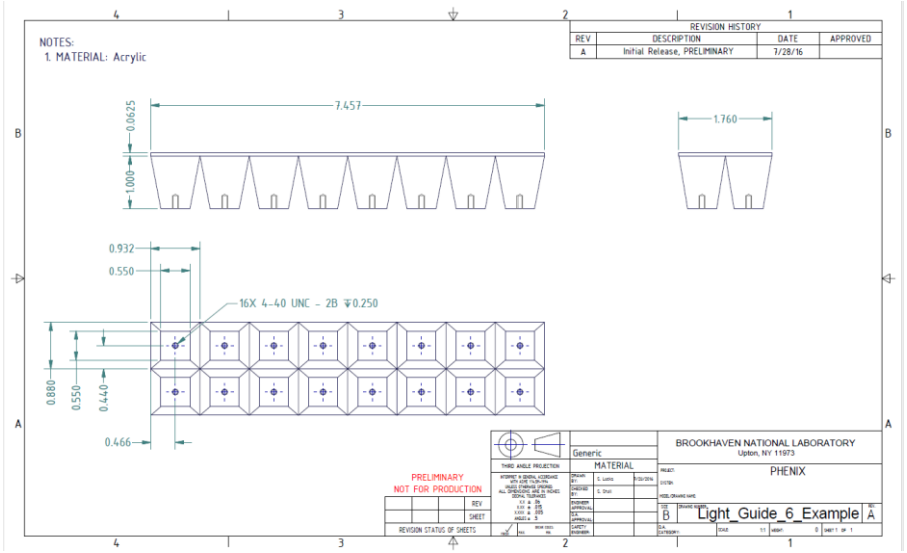


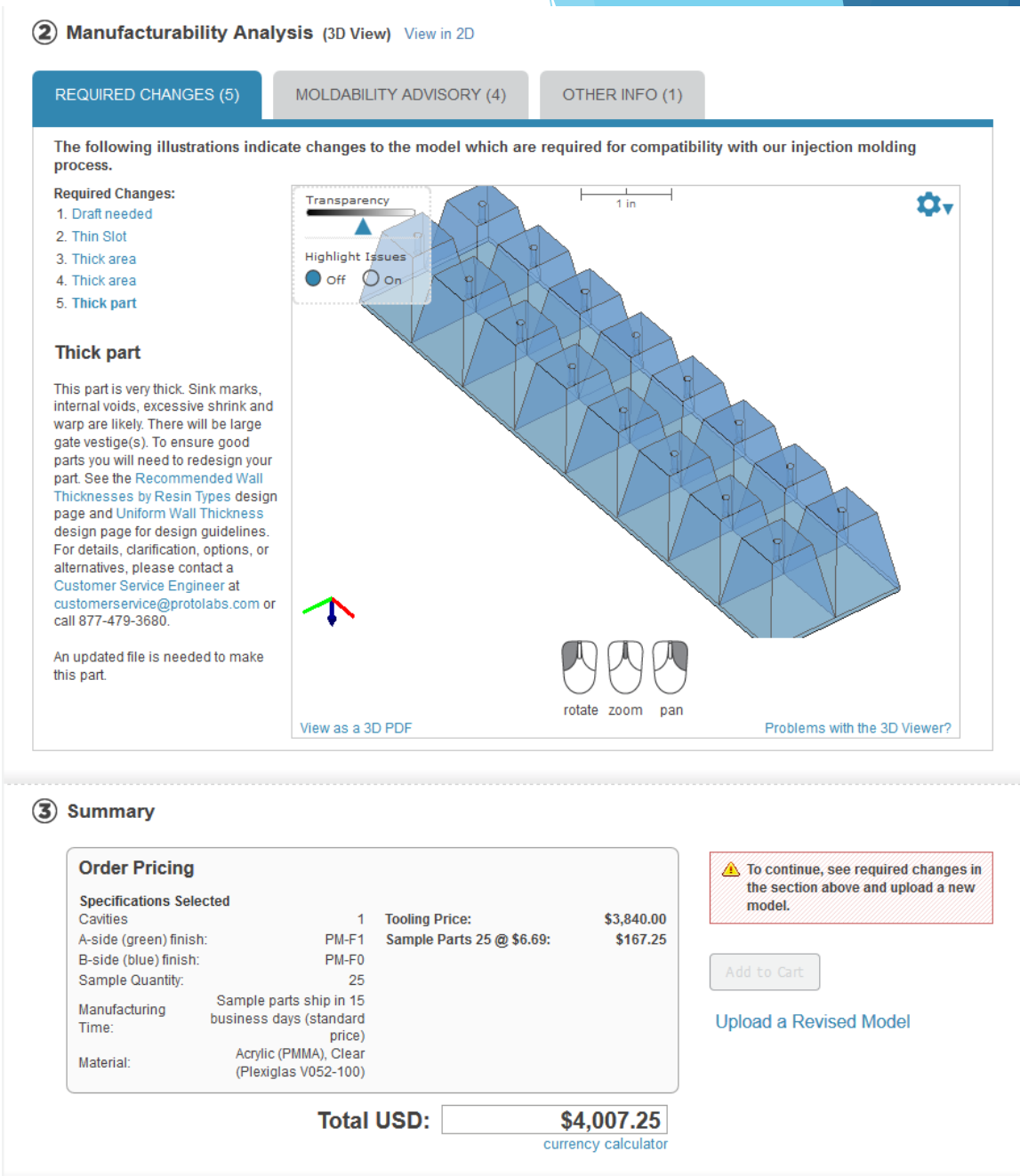

measured transmission of acrylic light guides
% transmission
wavelength (nm)
100
80
60
40
20
0
300
400
500
600
700
800
McMaster stock 1" cube
SBU machined and polished (w/ tapped hole)
BNL cast & polished
McMaster stock 1" cube - polished

- Spoke with plastics manufacturing companies about injection molding of light guide assembly (2x8)

- ProtoLabs, Natech Plastics, Hansa Plastics

- Some issues with process/design:
  - Material thickness may cause deformities as acrylic cures
  - Size/complexity of part/mold – would be easier to make individual towers, possibly multiple shapes in one mold.
- Initial quote from ProtoLabs - $6.70 per piece for ~1200 2x8





Updated quote for 2x2 part

w/ polished surfaces

proto labs
Real Parts. Really Fast.

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Injection Molding Quote

Prepared for: **Battelle & SUNY for SBU / Brookhaven National Lab**
Process: **Plastic Injection Molding**
Quote Number: **473981**
Quote Date: **8/18/2016**
Part Name: **Light_Guide_20 rev -02**
Extents: **51.507 mm x 49.442 mm x 28.401 mm**

Thank you for the opportunity to quote your parts. We look forward to working with you on this project. If you have any questions, please contact us at 877.479.3680.

① Confirm or Modify Specifications and Review Pricing

Cavities:	1 cavity	
A-side (green) finish:	SPI-B1 (600 paper)	
B-side (blue) finish:	SPI-A2 (High polish)	
	Tooling Price:	**$5,030.00**
Sample Quantity:	25	**Sample Parts 25 @ $3.46:** **$86.50**
Material:	Acrylic (PMMA), Clear (Plexiglas V052-100)	
	Change Material Color	
Manufacturing Time:	Sample parts ship in 15 business days (standard price)	

Total USD: $5,116.50

currency calculator

- Also requested quotes from
    - Plastic Optics Inc / Align Optics
    - Luxexcel (3D printed optics)
    - Empire Precision
    - Diverse Optics
    - Natech Plastics

- Luxexcel (Netherlands) was communicative, but has a limit (20mm) on the height of the parts they can produce.
- Natech Plastics quoted: $20-24k for the mold, $2-3 per piece
- Have not yet received quotes from the others.